

University of Bahrain

*College of Information Technology
Department of Computer Science*

ITCS253 Discrete Structures II

First Semester 2013/2014

Final Exam – Two Hours

STUDENT NAME	
STUDENT#	
SECTION	

This exam contains 8 pages (including this cover page) and 10 questions. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated.

You are allowed to use Calculators.

You are not allowed to use books, notes, or mobiles

Question	Points	Score
1	6	
2	6	
3	7	
4	7	
5	6	
6	4	
7	6	
8	7	
9	5	
10	6	
Total:	60	

Instructor: Dr. Ali Alsaffar Sections 1 and 2

(3) [7 points] Define $*$ on $\mathbf{R} - \{1\}$ by $a * b = a + b - ab$. Is $(\mathbf{R}, *)$ a group? Prove your answer.

[illegible]

- (5) (a) [1 point] Write the Pascal Identity for $\binom{n-1}{k+1}$.

$$\binom{n-1}{k+1} =$$

- (b) **[5 points]** If n is a positive integer $n > 1$, prove that $\binom{n}{2} + \binom{n-1}{2}$ is a perfect square.

- (6) (a) [4 points] Suppose $\sum_{k=0}^{50} \binom{50}{k} 8^k = x^{100}$. Find the value of x

- (9) [5 points] If every vertex of a simple connected graph G has degree 2, prove that G is not a tree.

- (10) A tree T has 5 leaves, 3 vertices of degree 2, and r vertices of degree 3.

(a) [2 points] Find the value of r .

(b) [2 points] Determine the number of vertices n and the number of edges e of the tree.

(c) [2 points] Is the tree a full binary tree. Justify your answer.
